devoted much time to cataloguing the stocks of back-numbers of the *Bulletin* and moving them to new storage at Tring, to ordering the mailing lists for the *Bulletin* and to arranging that separates should be produced for authors. A vote of appreciation to Sir Hugh was passed unanimously. Mr. Hogg thanked Mr. Tate for all he had done for the Club as Hon. Treasurer. He had been in that office for 12 years, a period not exceeded by any previous Hon. Treasurer and had devoted very much time and work to the Club. A vote of thanks to Mr. Tate was passed unanimously. The Hon. Secretary said that the meeting was well aware of its debt to Mr. Benson and it was hoped that he would be willing to resume office as Editor in 1975.

It was proposed by Mr. D. T. Holyoak and seconded by the Hon. Secretary that the meeting be adjourned until 6 p.m. on Tuesday 17th September 1974 at the Café Royal, 68 Regent Street, London, W.1 for consideration of the Accounts for 1973, and this was carried unanimously.

The meeting was adjourned at 6.30 p.m.

A re-examination of material of the extinct marabou stork, *Leptoptilos falconeri:* with descriptions of some new species

by C. J. O. Harrison

Received 1st February, 1974

Two marabou storks have been named as existing in pre-pleistocene periods. *Argala* (= *Leptoptilos*) *arvenensis* was listed by Milne-Edwards (1871) as a species of the French Miocene, but it is a nomen nudum. No material is known and it is possible that proposed specimens may have been referred to other species.

In the same work Milne-Edwards (1867–71), in a footnote to page 450 (incorrectly stated to be 449 in Brodkorb 1963), proposed the name *Argala falconeri* for another species. Brodkorb (1963) lists this also as a nomen nudum and regards Davies (1880) as the first valid description. He appears to have overlooked that on page 449 Milne-Edwards refers to four specimens from the Siwalik Hills of India, in the collection of the British Museum (Natural History) and that the name is then proposed with reference to these. They are listed as the distal and proximal ends of a tarsometatarsus, and two distal ends of tibiotarsi, measurements are given, and the greater size in comparison with Recent species is indicated as a valid character for specific separation. *Leptoptilos falconeri* (Milne-Edwards) 1868 would therefore appear to be the original description.

Davies (1880) refers to five specimens, four presented to the British Museum (Natural History) by Col. Sir P. T. Cautley in 1842, and one presented by Charles Falconer in 1868, under this name. Lydekker (1884) refers a further three specimens to this species, two from Cautley and one from Falconer, and in describing the largest distal end of the tibiotarsus says it "may be considered as the type". In a later catalogue (1891) he lists all specimens without special reference to this one; but Brodkorb (1963) lists it as the designated lectotype. It is an unfortunate selection in that the specimen, apart from its larger size, shows no useful characters for separation from Recent species.

This material referred to *L. falconeri* has been re-examined and I am of the opinion that it comprises the remains of three different bird species. Five

specimens, including the lectotype, appear referable to a very large marabou stork under the existing name. Although there is no indication that these were originally associated, the similarities of relative size and structure appear to justify referring them to a single species.

The lectotype tibiotarsus shows no obvious characters, apart from a much larger size, which would separate it from the corresponding bone of the larger Asiatic species of the Holocene, *L. dubius*. The other, paratypical specimens show distinct differences in some points of structure which would justify specific separation, and in which the Pliocene bird is more different from the three Recent species than they are from each other.

In the comparison of Pliocene and Holocene material this similarity in one bone and differences in others may have particular relevance. Although it has been claimed that some Recent species existed in the Pliocene, Brodkorb (1971) contends that the Pliocene birds were specifically distinct and that in general Recent species evolved during the Pleistocene. If the Pliocene records are based on single, or few, skeletal elements then a similar situation might occur to that apparently shown by the present species, where a particular bone might give no indication of difference, although differences existed in other parts of the skeleton, and where it might be assumed that a Recent species had been in existence at a much earlier period when a morphologically distinct, although possibly ancestral, form might be involved.

The three remaining specimens consist of two distal ends of tibiotarsi, one very incomplete, and the extreme proximal end of a tarsometatarsus with most of the hypotarsus. One tibiotarsal fragment is virtually indistinguishable in size and shape from those of the Recent *L. dubius*. The other more extensively damaged fragment (fig. 4) is that of another stork, possibly related to *Ciconia* species but not definitely referable to known Recent or extinct species, and apparently a new form. It is from a large bird, only slightly smaller than *L. dubius*. The tarsometatarsal fragment appears to be that of a marabou (fig. 3), in some respects most similar to *L. crumeniferus* of Africa. Since, as in the larger species, it is this and not the tibiotarsus that shows characters which might justify specific separation I regard this as the holotype and refer the first of the two smaller tibiotarsi to it.

Rich (1972) has assigned a distal end of a tarsometatarsus and a tibiotarsus from the Upper Miocene Beglia Formation of Tunisia to *Leptoptilos* cf. *falconeri*. The species was a small one, intermediate in size between *L. crumeniferus* and *L. javanicus*. The tarsometatarsus shows a trochlea for the 3rd digit shorter and broader in proportion than that of *L. falconeri*, having a distally short trochlea for the 2nd digit with a posteriorly and proximally displaced outer rim (fig. 1, lower right; 2, top). The tibiotarsus has a larger and disto-proximally longer posterior articular surface in the intercondylar region. There seems no reason to assign this bird to *L. falconeri* other than on its age. It appears to represent a discrete form and I have therefore treated it as a new species, *L. richae*.

The three Recent species of *Leptoptilos* show small interspecific osteological differences. The fossil forms discussed here show, even on the fragmentary material available, more distinct differences which are usually greater than the more recent interspecific variations. It therefore seems best to treat all these earlier forms as separate units distinguished by name.

The relative similarity to each other of the three Recent species within the genus as a whole suggests that they are probably derived at a later period from a common ancestral stock, probably diverging during the period of active speciation in Africa and Asia during the Pleistocene. In addition we

Figure 1. Anterior view of distal end of tarsometatarsus of – top left, *L. dubius*; top right, *L. javanicus*; bottom left, *L. falconeri*; bottom right, *L. richae* (the last, after Rich 1972, is on scale approx. half as large again as others).

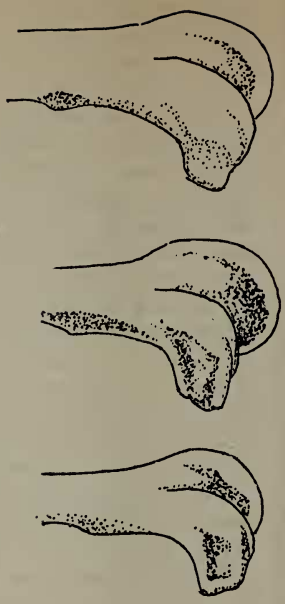

Figure 2. Lateral, internal view of distal end of tarsometatarsus of – top, *L. richae*; middle, *L. falconeri*; bottom, *L. dubius* (the first, after Rich 1972, is on scale approx. half as large again as others).

Figure 3. *L. sivalicensis*, holotype, proximal end of tarsometatarsus. Internal and proximal views.

Figure 4. *Cryptociconia indica*, holotype, distal end of tibiotarsus. Anterior and internal views.

have two Pliocene and one Miocene species. There is some evidence that on the fossil forms the anterior condylar projections of the distal ends of tibiotarsi are slightly longer, relative to the width of the ends, than on Recent species; but apart from this the scanty material available does not appear to indicate any general evolutionary trends, unless one interprets the variation in the distal end of the tarsometatarsus (fig. 1) as evidence of a long-term tendency for an increase in the distal projection of the trochlea for the 2nd digit. It is possible that these earlier forms are close to the evolutionary stem of the genus, but there is no definite evidence to indicate whether any should be regarded as ancestral to the Recent species or whether they should be regarded as minor divergences from a main evolutionary trend. There is certainly no good evidence to justify the creation of palaeospecies.

SPECIES DESCRIPTIONS

Leptotilos falconeri (Milne-Edwards) 1868

Emended diagnosis. Very large. On tarsometatarsus, trochlea for third digit large, extending distally well beyond other trochleae. Trochlea for second digit posteriorly displaced. Distal end of humerus with shaft less inflated anconally; groove between attachment of anterior articular ligament and internal condyle broad and deep; entepicondylar prominence and attachment of anterior articular ligament large. Distal end of femur with rotular groove deep and narrow and external edge of popliteal hollow well-defined. First phalanx of second digit of manus with metacarpal facet deep relative to width.

Material. Lectotype, designated by Lydekker (1884), a distal end of a right tibiotarsus, B.M. (N.H.) no. 39735 (erroneously quoted by Brodkorb 1963 as 39753). Paratypes, a distal end of a left tarsometatarsus, B.M. (N.H.) no. 39736; a distal end of a left femur, B.M. (N.H.) no. 39737; and a proximal portion of the first phalanx of the second digit, B.M. (N.H.) no. 39738; all the above specimens including the lectotype being presented by Col. Sir P. T. Cautley in 1842. Also a distal end of a left humerus, B.M. (N.H.) no. 48435, presented by Charles Falconer in 1868.

Occurrence. Siwalik Series, Lower Pliocene; Siwalik Hills, Uttar Pradesh, India.

Description. The lectotype is the distal end of a right tibiotarsus with a short portion of the shaft (fig. 1, lower left; 2, middle). It has undergone some pressure, the internal condyle showing a slight inward deflection and some damage to its outer edges. The shaft has been subject to crushing and deformation, and anterior projections proximal to the condyle are superficially eroded. The characters it shows do not differ distinctly from those of the Recent species, being perhaps most similar to those of *L. javanicus*.

The condyles are stout and rounded anteriorly and posteriorly, and concave on the anterior outer surfaces. The internal ligamental prominence is large. There is a large, rounded and relatively deep intercondylar hollow distal to the supratendinal groove.

The distal end of a left tarsometatarsus is broken off at the metatarsal facet. It is in good condition with the posterior tips of the outer trochleae and the internal posterior edge of the trochlea for the 2nd digit showing some wear and erosion. In general it is very similar to the tarsometatarsus of Recent species but the trochlea for the 3rd digit is larger, extending further distally and more prominent anteriorly. The anterior edge of the external rim of the trochlea for the 2nd digit is slightly more prominent laterally.

The distal end of the left femur is broken off just proximal to the popliteal area. The fibular groove and posterior intercondylar fossa are worn and the posterior external condyle edge slightly eroded. Other surfaces show small areas of damage. The rotular groove is deep and well-defined, narrower in comparison to those of Recent species, with a prominent and anteriorly tapering posterior external condyle. The popliteal cavity is deep and appears to have a deep and well-defined inner margin, the external portion of the shaft forming a definite ridge bordering it. This does not appear to be the result of distortion.

The proximal part of the first phalanx of the second digit consists of a little over a third of the bone, with the flange mostly broken away. The proximal end is stout, with the metacarpal facet deep relative to its width.

The distal end of a left humerus is again very similar to those of Recent species. It appears to lack any suggestion of proximal anconal inflation of the shaft however. The attachment surface for the anterior articular ligament forms a blunt and palmarly prominent ridge in these birds and in the present species is particularly prominent; while the entepicondyle appears to show greater lateral projection.

Measurements. Lectotype. Greatest length 52·8; width and depth of shaft (damaged) at level of proximal opening of supratendinal bridge 20·4 × 16·8; width at distal end 28·0; width of posterior condylar area 22·9; anterior/posterior thickness of intercondylar groove 22·6; anterior length of external condyle 24·8; anterior/posterior width of internal condyle 34·0, of external condyle 34·8; width of tendinal bridge 8·1 mm. *Tarsometatarsus.* Greatest length 42·6; proximal width and thickness 23. 1 × 1·0; length from mid proximal end of shaft to trochlea for 2nd digit 39·5, to trochlea for 4th digit 39·9; anterior length of trochlea for 3rd digit 25·4, posterior length 17·0, dorsal width 13·4, greatest depth 17·5; same measurements for 2nd digit 19·8, 11·1, 10·1, 17·8; for 4th digit 21·6, 12·0, 10·4, 18·7; greatest distal width 36·0; dorsal distal foramen to external intertrochlear notch 8·2 mm. *Femur.* Greatest length 41·5; greatest width 46·8; anterior/posterior width of external condyle 41·2; distal width of rotular groove 16·1, proximal width 13·8; anterior/posterior thickness of external side 35·3, of internal side 29·0 mm. *Phalanx.* Greatest length 29·2; width of shaft at distal end 12·1; thickness of external side 5·8; width of anterior surface at metacarpal facet 15·7; depth of facet 13·1; posterior/external to anterior/internal edges of facet 15·0 mm. *Humerus.* Greatest length of fragment 66·9; width and greatest thickness of proximal end of shaft 35·7 × 20·7; greatest distal width 57·7; thickness at external condyle, 29·0, at internal condyle 19·8; attachment of anterior articular ligament to ridge of internal tricipital groove 27·5 mm.

Leptoptilos siwalicensis, sp. nov.

Etymology. The specific name is derived from that of the range of hills in which the specimens occurred.

Diagnosis. Moderately large. Proximal end of tarsometatarsus with internal side stout. Hypotarsus only slightly posteriorly elevated. Anterior ends of calcaneal ridges abrupt. Slanting muscle attachment surface at proximal posterior edge of external side large.

Material. Holotype a proximal end of a left tarsometatarsus, B.M. (N.H.) no. 39741, presented by Col. Sir P. T. Cautley in 1842 (fig. 3). Paratype a distal end of a right tibiotarsus, B.M. (N.H.) no. 39734, from the same source.

Occurrence. Siwalik Series, Lower Pliocene; Siwalik Hills, Uttar Pradesh, India.

Description. The holotype is the extreme proximal end of a tarsometatarsus with the greater part of the hypotarsus present but most of the anterior surface missing except in the region of the cotyla (fig. 3). It has a general similarity to those of Recent species, but the internal side at the proximal end is stouter, anterio-posteriorly thicker, where it borders the hypotarsus. The base of the hypotarsus appears smaller, the whole structure projecting less posteriorly. Perhaps partly as a result of this the calcaneal ridges arise more abruptly and the area of posterior surface immediately around them is flatter. The attachment surfaces on the posterior and anterior edges of the proximal end of the external side are large.

The tarsometatarsus is slightly smaller than that of the Recent *L. dubius*. The distal end of a tibiotarsus is very similar to that of the latter species, very slightly larger in the condylar region and with a stouter shaft. Compared with those of Recent species the anterior portions of the condyles, particularly that of the internal condyle, are longer and narrower relative to the width of the distal head.

Measurements. Tarsometatarsus. Greatest length of fragment 34·5; greatest proximal width 28·6; width at cotyla lips 24·3; posterior projection of hypotarsus, to rim of internal calcaneal ridge 19·5; to external calcaneal ridge 16·7; posterior external muscle scar 9·6 × 6·8 mm. *Tibiotarsus.* Greatest length of specimen 61·4; anterior length of internal condyle 18·9; of external condyle 19·0; anterior/posterior thickness at internal condyle 30·6, at intercondylar groove, 19·4, at external condyle 31·6; greatest distal width 24·4; posterior length of external condyle 16·6; width and thickness of shaft c. 35 mm proximal to condyles 15·3 × 13·8 mm.

Leptoptilos richae, sp. nov.

Etymology. The species is named after Mrs. Pat Vickers Rich who described the specimens.

Diagnosis (based on Rich 1972). Tarsometatarsus with trochlea for the third digit relatively short and anteriorly broad. Trochlea for the second digit does not extend as far distally and has the outer rim much reduced and posteriorly and proximally displaced. Internal intertrochlear notch wide. Distal end of tibiotarsus has posterior articular surface of intercondylar region distoproximally long. Internal condyle projects anteriorly beyond external condyle. In external view posterior edge of shaft straight.

Material. Holotype a distal end of a right tarsometatarsus, no. T-3604, Colorado Tunisian Collection, Service Géologique, Tunis. Paratype a distal end of a right tibiotarsus, no. T-1396, in the same collection.

Occurrence. Lower Faunal Level (localities 17 and 20); Beglia formation. Upper Miocene; Bled ed Duoarah, Tunisia.

Description (based on Rich 1972). The holotype is a distal end of a right tarsometatarsus, broken across diagonally a little below the metatarsal facet, and lacking the trochlea for the fourth digit and the lateral side proximal to it (fig. 1, lower right). The trochlea for the third digit is narrow posteriorly with a proximal taper; but anteriorly it is broad in relation to its length. The internal intertrochlear notch is wide, although this is partly modified anteriorly by the projecting flange of the trochlea for the third digit. The trochlea for the second digit is laterally and posteriorly displaced with a distinct external angle at the proximal end. Its concave inner side extends distally for about three-quarters the length of the other trochlea, but its external facet is reduced, and proximally and posteriorly displaced (figs. 1, lower right; and 2, top). The distal end, viewed anteriorly, shows a strong

proximo-external slant, and in lateral view a prominent posteriorly-directed flange is apparent.

The distal end of a tibiotarsus shows the typical rounded anterior and posterior condylar surfaces. The posterior, intertrochlear articulation surface is distoproximally longer than that of other species, and the posterior condylar flanges larger. In distal view the posterior and anterior edges of the internal condyle appear more anterior relative to the external side. In lateral view the posterior of the shaft, proximal to the condyles, is straight. Anteriorly the tendinal canal is not internally deflected where it enters the proximal opening of the supratendinal bridge. The distal opening of the bridge is more medially placed than in Recent species and the internal ligamental prominence is level with the distal edge of the supratendinal bridge and not distal to it.

Measurements (after Rich 1972). *Holotype.* Distal width of trochlea II 6·4; of trochlea III 9·8; internal depth of trochlea II 13·0, of trochlea III 16·0; lateral depth of trochlea II 13·5, of trochlea III 16·4; posterior length of trochlea II 11·9, of trochlea III 15·7; anterior length of trochlea II 17·6, of trochlea III 23·2, width across trochleae II and III 26·0; width and depth of shaft at proximal end of intertrochlear foramen 26·1 × 6·2; length of foramen 5·2; maximum width of foramen 3·7 mm. *Tibiotarsus.* Greatest width across anterior condyles at distal end 18·6; minimum width of posterior condyles at distal end 15·3; greatest width of internal condyle 8·0; anterior length of internal condyle 16·3; anterior/posterior width of external condyle 25·1; width of shaft at proximal end of supratendinal bridge 13·6; width across condyles at their proximal end on posterior surface 8·3 mm.

Cryptociconia, gen. nov.

Etymology. The generic name is formed from the Greek prefix *crypto* (=hidden) and *Ciconia* (=a stork), in reference to the length of time during which this form has been overlooked.

Type species. Cryptociconia indica, gen. et sp. nov.

Diagnosis. Distal end of tibiotarsus has large internal condyle with anterior surface rounded but posterior tapering proximally to an abruptly terminating flange. Internal ligamental prominence projecting only slightly. Anterior portion of internal condyle narrow relative to its length.

Cryptociconia indica, sp. nov.

Etymology. The specific name refers to the country of origin.

Diagnosis. The only known species of its genus. Characters those of genus.

Material. An incomplete distal end of a tibiotarsus, B.M. (N.H.) no. 48444, presented by Charles Falconer in 1868 (fig. 4).

Occurrence. Siwalik Series, Lower Pliocene; Siwalik Hills, Uttar Pradesh, India.

Description. The holotype is a distal end of a left tibiotarsus, the shaft broken off just proximal to the supratendinal bridge anteriorly; and to the condylar groove posteriorly. The external condyle is extensively broken anteriorly and posteriorly. Except for the narrowness of the anterior part of the internal condyle the specimen shows a general similarity to the corresponding parts of Recent *Ciconia* species in shape, but is considerably larger. Viewed laterally, the internal condyle is rounded anteriorly, with a very slight posterior slant, but posterior to this tapers towards the proximal posterior end of the intercondylar groove where it forms a prominent flange terminating as an abrupt posterior projection. Anteriorly the smaller features are damaged or eroded, but there is evidence of a laterally broad, medially

placed tubercle on the supratendinal bridge, the latter having a marked disto-anterior slant. In length relative to width the anterior part of the internal condyle is more similar to that of *L. siwalicensis* than those of the Recent smaller storks which it otherwise resembles. In general size it would seem to have been only slightly smaller than the large Recent Marabou, *L. dubia*.

Measurements. Greatest length of specimen 28·7; greatest distal width 20·7; anterior/posterior thickness at internal condyle 30·3; posterior proximal projecting flange 5·2; anterior length of internal condyle 17·8; thickness (measured on outer side to condylar lip) 9·0; anterior/posterior thickness at intercondylar groove 18·7; width of supratendinal bridge 7·6 mm.

SUMMARY

Various Pliocene and Miocene fossil specimens have been referred to the extinct marabou stork, *Leptoptilos falconeri*. A re-examination reveals that several species are involved. The distal end of the tibiotarsus, available for all these species and often used as a holotype for extinct stork species, does not show useful characters for separation in the present species although such characters are present on other bones. It is suggested that the apparent uniformity of a skeletal element such as this in birds in which other parts differed might give rise to assumptions that Recent species existed at much earlier periods when in fact morphologically distinct forms were involved.

Of eight Pliocene specimens originally referred to *L. falconeri*, five are here considered referable to a very large species under this name; two to *L. siwalicensis* (*sp. nov.*), a species of similar size to the Recent *L. dubius*; and one to *Cryptociconia indica* (*gen. et sp. nov.*), an unrelated stork of similar size to the last. The two Miocene specimens assigned by Rich to *L. falconeri* appear to constitute another species, *L. richae* (*sp. nov.*).

References:

Brodkorb, P. 1963. Catalogue of fossil birds, part 1. *Bull. Florida Sta. Mus., Biol. Sci.* 7: 180–293.

— 1971. Origin and evolution of birds. *In* Farner, D. S. & King, J. R. (eds.). *Avian Biol.* 1: 19–55.

Davies, W. 1880. On some fossil bird remains from the Siwalik Hills in the British Museum. *Geol. Mag.* n.s. decade 2, 7: 18–27.

Lydekker, R. 1884. Siwalik birds. *Mem. Geol. Surv. India* 10: 3.

— 1891. *Catalogue of the fossil birds in the British Museum* (*Natural History*). London: Brit. Mus. (Nat. Hist.).

Milne-Edwards, A. 1867–1871. *Recherches anatomiques et paleontologiques pour servir a l'histoire des oiseaux fossiles de la France*. Paris: Masson.

Rich, P. V. 1972. A fossil avifauna from the Upper Miocene Beglia Formation of Tunisia. *Notes Serv. Geol. Tunisia* 35: 25–66.

The structure of feathers in *Chlorophanes purpurascens*

by L. Auber

Received 12th January, 1974

INTRODUCTION

The Trustees of the British Museum (Natural History) have been kind enough to place at my disposal three contour feathers, each from a different region of the plumage (chest, rump and crown), of the unique specimen of *Chlorophanes purpurascens* Sclater & Salvin (1873, *Nomen. Av. Neotrop.*: 157. Venezuela), redescribed and illustrated by Sclater (1886: 31 and pl. iv). This specimen has also been considered by Hellmayr (1935: 250). It is referred to hereafter simply as "the holotype".